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⑰ Applicant: **SCAN COIN AB**  
**Jägershillgatan 26**  
**S-213 75 Malmö (SE)**

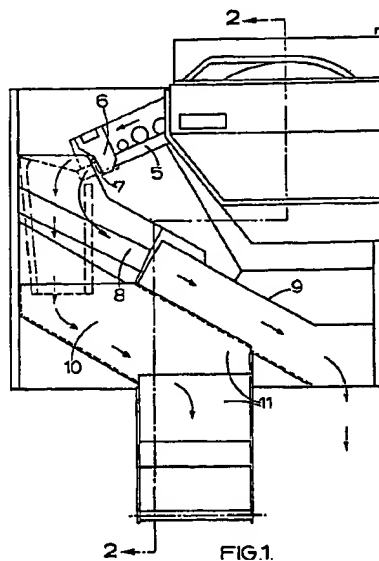
⑱ Inventor: **Goh, David**  
**Grange Farm Stirchley Road**  
**Stirchley Telford Shropshire (GB)**

**Howells, Geoffrey**  
**24, Pitreavie Road Cosham**  
**Portsmouth Hampshire PO6 2ST (GB)**

⑲ Representative: **Spall, Christopher John et al**  
**BARKER, BRETTELL & DUNCAN 138 Hagley Road**  
**Edgbaston Birmingham B16 9PW (GB)**

⑥ Coin acceptance apparatus.

⑦ The apparatus is intended to determine the value of a batch of mixed coins inserted by the user into a hopper unit (1) in which there is a rotatable disc (2) for feeding the coins in single file past a coin discriminator (6) to an escrow region (11). The total value of the coins retained temporarily in the escrow region (11) is displayed on a suitable display to the user, who can then choose either to have the coins returned to him, or allow the transaction to proceed for which the coins are payment. The apparatus may be used in a bank to issue a receipt for coins inserted, or as a lottery machine to issue lottery tickets. The machine can be arranged to return the coins in the escrow region automatically to the user if the value of such retained coins does not, after a certain time, fall within a preset range.



**FIG.1**

## Description

## COIN ACCEPTANCE APPARATUS

This invention relates to coin acceptance apparatus having a coin receiving unit into which a user can place a batch of mixed coins, evaluating means for assessing the total value of coins in the batch, and indication means for indicating the total value of the coins to the user.

We consider that it would be advantageous for many different outlets to be able to provide such a machine with an escrow device to enable the coins to be returned to the user in certain circumstances if the customer so desires, but it is highly desirable that the apparatus should be kept relatively simple.

A rather complicated, bulky and necessarily expensive machine of this kind has been described in U.S. Patent Specification No. 4,558,711. That machine has a hopper unit with a horizontal disc into which a batch of mixed coins can be placed, and the coins are conveyed from the hopper in single file past coin discrimination devices by a first conveyor arrangement, and are then carried by two further conveyors to be deposited on a fourth conveyor for return to the hopper. If the user agrees with the displayed assessment of the total value of the coins, the coins are then conveyed again by the first conveyor for sorting.

According to one aspect of the present invention a coin acceptance apparatus comprises a coin receiving hopper assembly into which a user can place a batch of mixed coins, a rotatable disc inclined to the vertical for feeding coins from the hopper in single file to a coin discriminator, the coins on leaving the disc being carried by gravitational force alone into a coin escrow device positioned at a lower level than the coin discriminator, the coin escrow device having in its base door means which is selectively operable to direct the coins either to a return chute for collection by the user, or to an acceptance region not accessible to the user, and indication means for indicating to the user the total value of the coins received in the escrow device as determined by the coin discriminators.

The door means is selectively operable by the user or/and automatically by pre-programmed software.

Thus we provide a hopper-fed escrow in which the coins are directed simply by gravity, without the use of conveyors, to an escrow device positioned at a lower level, the coin discrimination means being arranged at a convenient location at which the coins are moving in single file.

Although the coin discriminator could determine the coin denominations whilst the coins are still being conveyed by the coin disc, preferably the discriminators are positioned to examine the coins as they roll down a ramp to the upper end of which the coins are fed by the disc.

The coin discriminator preferably then incorporates a rejection means arranged to direct unacceptable coins and bogus coins to a reject chute for return to the customer, without the coins entering the escrow.

The escrow preferably comprises an open-topped box of volume commensurate with the volume of the hopper to enable a large batch of coins to be handled.

The door means may comprise a pair of doors which lead respectively to the return chute and to the acceptance region, but alternatively a single door may be provided which is arranged to tilt downwards in one sense when the coins are to be directed to the return chute, but in the opposite sense when the coins are to be directed to the acceptance chute.

In some circumstances we consider it desirable that it be arranged that the coins be returned automatically to the user when a predetermined criterion has not been met.

The criterion may be that a predetermined minimum value of coins evaluated by the machine is reached within a predetermined time.

A minimum value as the criterion would be appropriate, for example, in the case that transactions below the minimum value are considered uneconomic by the machine owner. When the apparatus is adapted to dispense lottery tickets, the minimum value would be the permitted minimum stake. Also, the minimum value criterion would be appropriate in the circumstance that automatic return of coins is required where a fixed value has not been tendered, such as at a toll booth.

The criterion may be that a predetermined maximum value of coins is not exceeded within a predetermined time.

A maximum value as the criterion can be appropriate in some applications to minimise the risk of fraud. In a lottery ticket dispenser a maximum value would place a maximum on the permitted stake. A maximum value can also be used to avoid overflowing of the escrow.

Coins in excess of the maximum value are preferably arranged to be automatically returned to the user by the rejection means, and thus do not enter the escrow means.

Preferably the criterion is that the value of coins evaluated by the machine within a predetermined time falls within a predetermined range. If the value of the coins evaluated within the predetermined time does not exceed the lower range limit, then the escrow door means is operated to direct the coins held in the escrow to the return chute. On the other hand when the total value of the coins which have passed the discriminator and been accepted reaches the upper range limit, further coins fed by the disc are returned by the rejection means.

Preferably the apparatus is arranged to count the number of coins which are rejected by the rejection means, in order to detect an attempted fraud, and if this number exceeds a predetermined amount within a predetermined period, or during one attempted operation of the apparatus, it is arranged that all coins in the escrow are automatically returned to the user.

Preferably the apparatus is then rendered inoperative for a suitable period. The apparatus may be arranged to simulate a fault condition.

There are many uses to which apparatus in accordance with the invention may be put. In one embodiment the apparatus may be used in a bank as a coin acceptance device to enable a customer to pay coins into the bank. The customer is thereby given the opportunity of having the coins returned to him or her if he does not agree with the value displayed. If he permits the coins to pass from the escrow to the coin acceptance region, by operating an appropriate actuator, it may be arranged that a receipt is provided to the user recording the total value of the coins.

In another embodiment the apparatus is associated with a device for dispensing one or more lottery tickets, the lottery ticket being arranged to be dispensed once the user has indicated his decision to allow the coins to pass to the acceptance region, which is a secure money collection container.

A coin acceptance apparatus in accordance with the invention will now be briefly described, by way of example only, with reference to the accompanying drawings in which:-

Figure 1 is a front elevation of the apparatus;

Figure 2 is a vertical cross-section on the cranked line 2-2 of Figure 1; and

Figure 3 is a flow chart of the software of the control means.

A coin hopper 1 of the size to accommodate a large number of coins contains an inclined rotatable coin dispensing disc 2 driven by a motor 3 in response to the detection of coins inserted into the hopper by a coin detector 4. The disc in this embodiment is a flexible disc (the subject of Patent No. G.B. 1,491,299), but a conventional rigid, inclined disc could be employed.

In a well known manner the coins are picked out by the disc from the hopper and fed in single file to the upper end of a coin ramp 5 down which the coins roll, a coin discriminator 6 of any suitable kind, such as an inductive coil device, being positioned alongside the ramp for determining the coin denominations.

Any coins which cannot be identified are rejected by a solenoid-operated reject pin 7, and such coins are projected forwards such that they fall into a suitably positioned guide channel 8 which directs them into a reject chute 9 for return to the user.

Coins which are identified by discriminator 6 are permitted to fall down a duct 10 which leads directly into an escrow region 11 at the base of which is an escrow door 12. The door 12 is capable of being selectively pivoted by respective solenoids about either the axis of pin 13 or about the axis of pin 14, in dependence upon whether or not the user presses a return button or an accept button, not shown. The user takes this decision on the basis of a digital display, not shown, of the total value of the money that has been permitted to pass into the escrow region 11.

The control unit, not shown, for controlling the operation of the escrow door 12 preferably includes a microprocessor unit in the associated memory of

which is stored preset maximum and minimum total values, and the unit is programmed such that if the total value of the money passed to the escrow region 11 by a predetermined time, from the first detection of coins by detector 4, does not lie between those values, the escrow door is automatically operated so as to return the coins in the escrow region 11 to the user.

Figure 3 is a flow chart of software to provide an efficient and advantageous operational sequencing of the device.

Figure 3 is largely self-explanatory, but a brief explanation will now be given for completeness.

The START function 19 is shown as a manual start button, but can be automatic. In box 20 the variable 'VALUE' is set initially to zero. Test 21 ascertains whether or not any coins have been inserted into the hopper 1, by observing the output of coin detector 4. The return loop 22 is repeatedly executed until one or more coins are detected by detector 4 whereupon box 23 starts running the disc motor 3, which is normally idle. The motor 3 is energised on a time-out which is arranged to be reset every time a coin is seen by detector 4. A time-out time of five seconds is typical.

When the motor 3 is running test 24 monitors whether a coin is detected by coin discriminator 6, test 25 determining the validity of the coin. If the result of the validity test is that the coin is not a valid coin then the rejection device 7 is operated by box 26. If the result of test 25 is yes, then the sum of the current amount of the variable 'VALUE' with the value of the coin just evaluated is compared with a preset maximum deposit amount 'MAXDEPOSIT' in test 27. If MAXDEPOSIT has not been exceeded, then the variable 'VALUE' is updated by adding on in box 28 the amount of the coin just evaluated. If, on the other hand, the result of the test 27 was yes, showing that the addition of that coin's value to the variable 'VALUE' would result in the maximum deposit value being exceeded then the coin is arranged to be rejected by reject pin 7 under the control of box 26. This ensures that the total value of the coins which is allowed to accumulate in the escrow region 11 does not exceed the total permitted maximum deposit value.

This arrangement of the software avoids the need to operate the escrow doors so as to reject all of the coins in the escrow region 11; only the excess coins are rejected, and the rejection function is provided by reject pin 7.

When the motor has time out then the result of test 29 will be yes, and the next test 30 determines whether or not any coins at all have been passed into the escrow. If no coins have been allowed to pass to the escrow then return loop 31 is executed, and the device will revert to sitting again in loop 22 until more coins have been put into the hopper. If, on the other hand, the result of test 30 is no, then the variable 'VALUE' is compared in test 32 with a preset minimum total value of coins in the escrow 'MINDEPOSIT'. If the total value of coins passed to the escrow region is found by test 32 to be less than 'MINDEPOSIT' then the return door of the escrow is operated by box 33 to return all of the coins in the

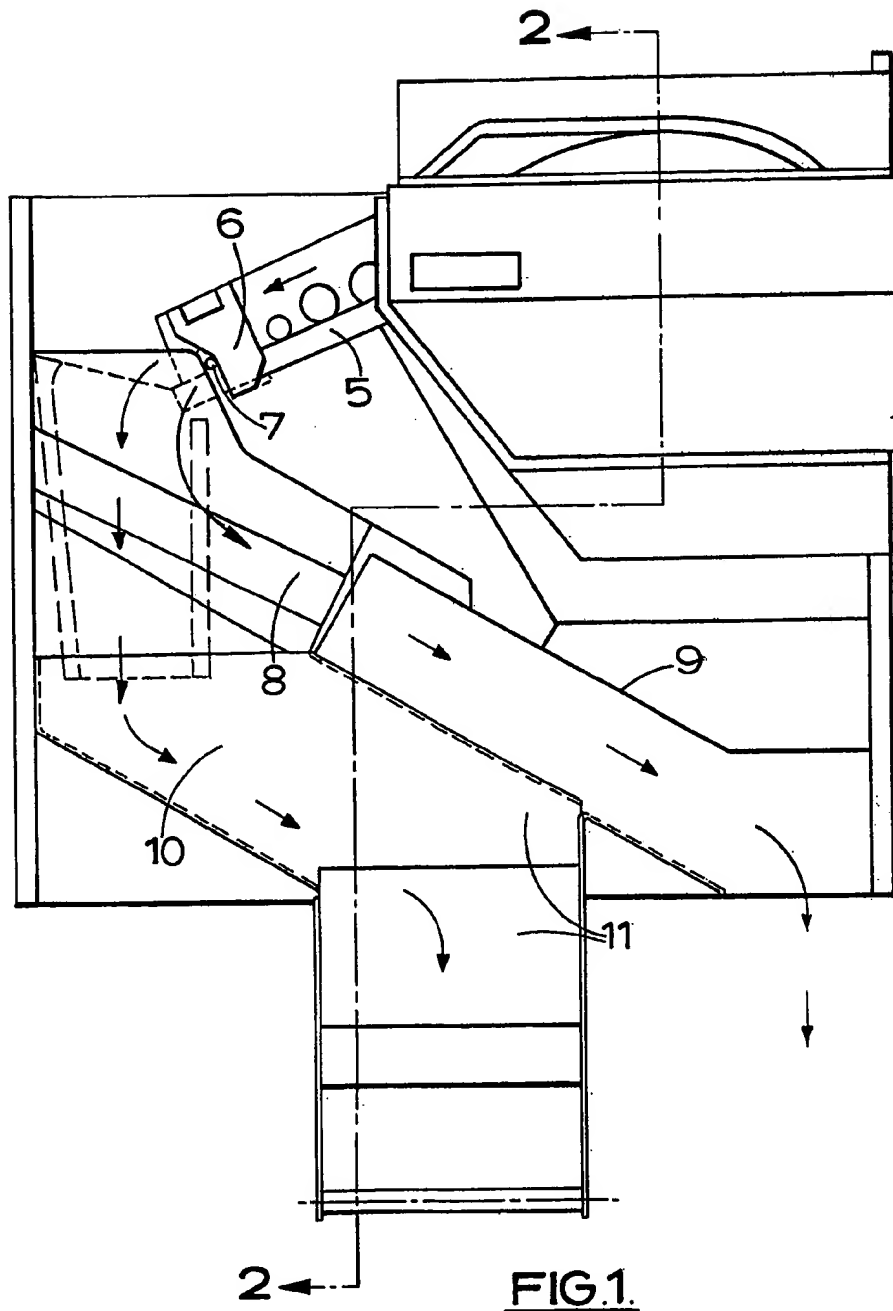
escrow to the user.

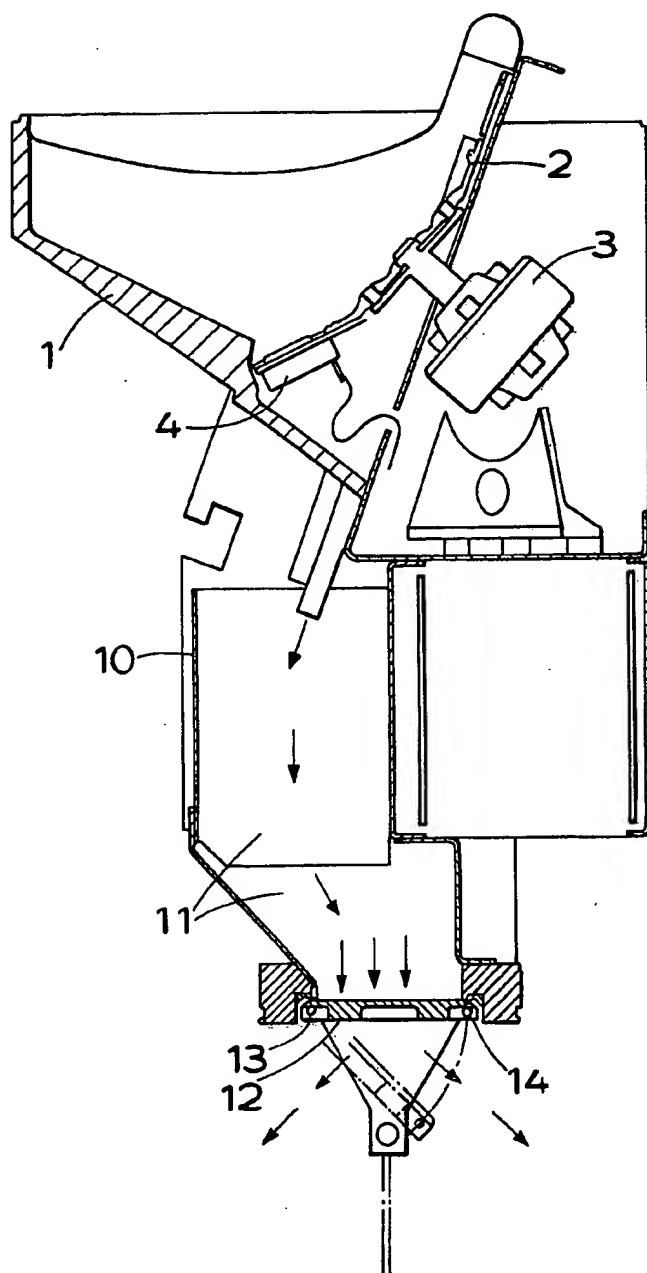
If the result of test 32 is no, that is the value of coins in the escrow is greater than 'MINDEPOSIT', then box 34 energises a display to the customer of the total value of coins in the escrow. The customer can then operate either return button 35 or deposit button 36.

is detected by the coin discriminator of a value such that if said coin were to enter the escrow device, the total value of the coins in said escrow device would exceed a predetermined maximum value.

## Claims

1. A coin acceptance apparatus comprising a coin receiving hopper assembly into which a user can place a batch of mixed coins, a coin discriminator, a rotatable coin feeding disc arranged to feed coins from the hopper in single file to the coin discriminator, the coins then proceeding to an escrow device, characterised in that the feeding disc (2) is inclined to the vertical and is arranged to pick out coins from the hopper (1), a gravitational coin patch (10) extending from the discriminator (6) into the escrow device (11) whereby coins are carried by gravitational force alone, without a driven conveying means, from the discriminator to the escrow device, the coin escrow device comprising a base, outlet door means (12,13,14) positioned in the base, door actuator means for operating the door means, a return chute and a coin acceptance path leading from the door means, a secure acceptance region into which the acceptance path leads, the acceptance region being inaccessible to the user, door actuator control means (33) arranged for selectively operating the door actuator means to direct coins in the escrow device either to the return chute or to the acceptance path, accumulator means (28) for accumulating the total value of coins received in the escrow device as determined by the coin discriminator, and indication means for indicating to the user the total value of coins received in the escrow device.
2. A coin acceptance apparatus as claimed in claim 1 characterised by a coin rejection means (7) positioned just downstream of said coin discriminator, a coin reject chute (9) leading from the rejection means, whereby operation of the rejection means causes a coin to be directed to the reject chute to prevent the coin entering the escrow device.
3. A coin acceptance apparatus as claimed in claim 2 characterised by control means (32,27) controlling the coin rejection means and the door actuator means and arranged to return coins automatically to the user when a predetermined criterion has not been met.
4. A coin acceptance apparatus as claimed in claim 3 characterised in that the criterion comprises a predetermined minimum value of coins being evaluated by said coin discriminator, and accepted, within a predetermined time.
5. A coin acceptance apparatus as claimed in claim 3 characterised in that the coin rejection means is arranged to be operated when a coin





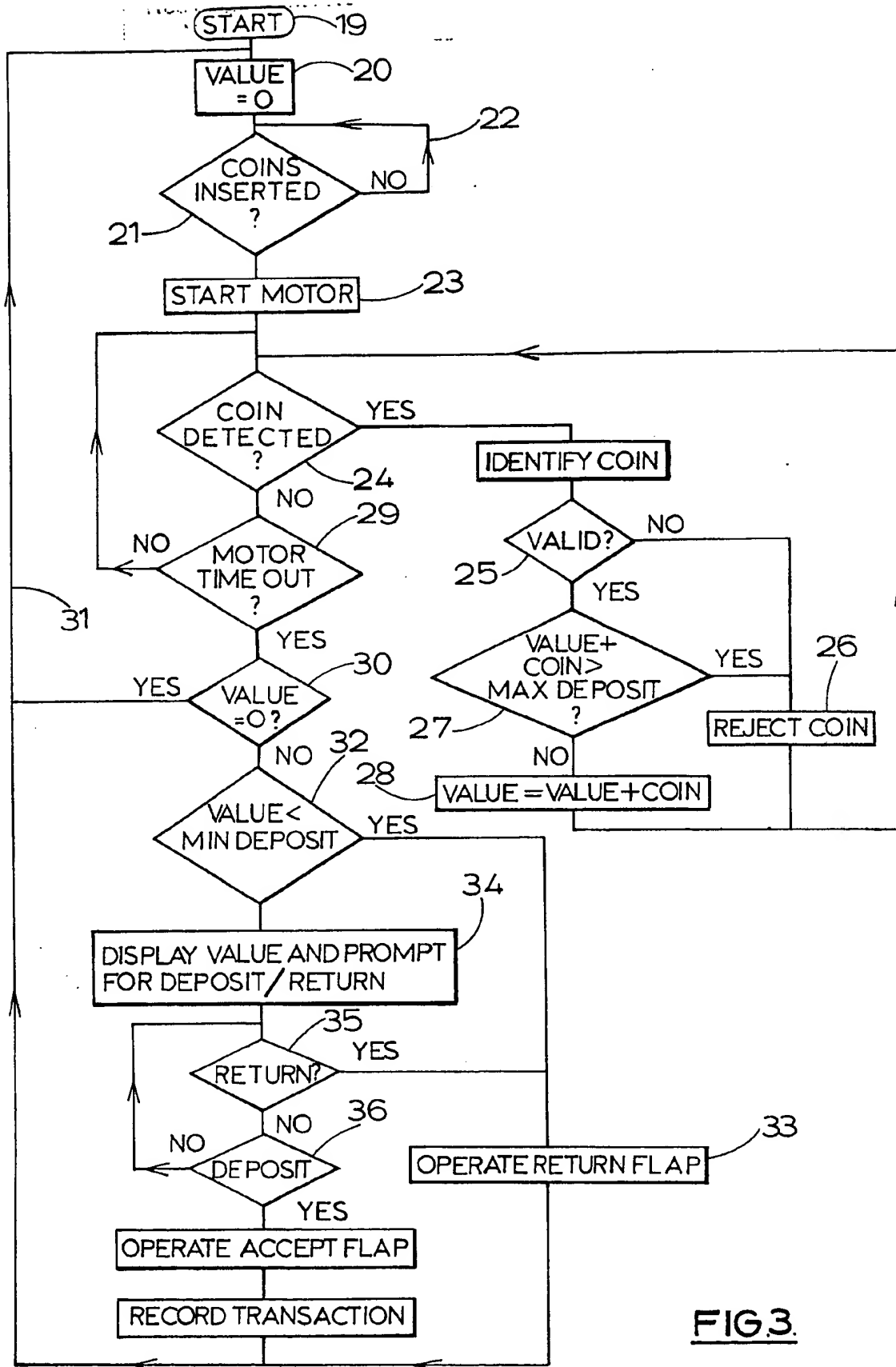


FIG. 3.

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INVENTOR-INFORMATION:

NAME

GOH, DAVID

HOWELLS, GEOFFREY

COUNTRY

N/A

N/A

ASSIGNEE-INFORMATION:

NAME

SCAN COIN AB

COUNTRY

SE

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ABSTRACT:

The apparatus is intended to determine the value of a batch of mixed coins inserted by the user into a hopper unit (1) in which there is a rotatable disc (2) for feeding the coins in single file past a coin discriminator (6) to an escrow region (11). The total value of the coins retained temporarily in the escrow region (11) is displayed on a suitable display to the user, who can then choose either to have the coins returned to him, or allow the transaction to proceed for which the coins are payment. The apparatus may

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